IN THE CLAIMS

Please amend the claims as follows.

For the Examiner's convenience, a list of all claims is included below.

1. (Previously Presented) A computer-implemented method for reversibly converting a data format as part of a coding and decoding process that includes compression, the computer-implemented method comprising:

performing a forward transformation and performing a backward transformation reciprocally on data being transformed between unit systems having different resolution levels defined by a brightness and a color difference, the forward transformation being performed prior to performing the compression,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and the method further comprising performing a reversible data conversion with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system,

wherein the first unit system is for a first color space and the second unit system is for a second color space that is based on three primary colors of lights, the first color space being different than the second color space and the second color space having the higher resolution level, and further wherein performing the reversible data conversion comprises determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations ~~is~~ based on all of the component values of the other of the first and second color spaces, and by using the first color space as the common unit

system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data.

2. (Previously Presented) The computer-implemented_method as claimed in claim 1, wherein the coding and decoding process includes performing

a digital color conversion by quantizing analog data in the first color space, and by using the first color space as the common unit system.

Claims 3 -5 (Cancelled)

6. (Previously Presented) The computer-implemented method as claimed in claim 1, wherein the coding and decoding process includes performing

a color conversion in accordance with an international standard in which the data format for converting an analog video signal into digital data is specified.

7. (Cancelled)

8. (Previously Presented) A computer-implemented method for reversibly converting a data format as part of a coding and decoding process that includes compression, the computer-implemented method comprising:

performing a forward transformation and performing a backward transformation reciprocally on data being transformed between unit systems having different resolution levels defined by a brightness and a color difference, the forward transformation being performed prior to performing the compression,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and the method further comprising performing a reversible data conversion with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system,

wherein the first unit system is for a first color space and the second unit system is for a second color space that is based on three primary colors of lights, the first color space being different than the second color space, and further wherein performing the reversible data conversion comprises determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations ~~is~~ based on all of the component values of the other of the first and second color spaces;

wherein the first unit system is a first color space, and the second unit system is a second color space having the higher resolution level, and further wherein the coding and decoding process includes controlling an original color based on the brightness and the color difference, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to

transform first data in the first color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data.

Claims 9-11 (Cancelled)

12. (Previously Presented) A computer-implemented method for reversibly converting a data format as part of a coding and decoding process that includes compression, the method comprising:

performing a forward transformation and performing a backward transformation reciprocally on data being transformed between unit systems having different resolution levels defined by a brightness and a color difference, the forward transformation being performed prior to performing the compression,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and the method further comprising performing a reversible data conversion with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system,

wherein the first unit system is a BMU unit system using an inch unit system and the second unit system is a 1/100 mm unit system using a meter unit system, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first

color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data, and

further wherein performing the reversible data conversion comprises determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations ~~is~~ based on all of the component values of the other of the first and second color spaces.

13. (Cancelled)

14. (Previously Presented) An apparatus for reversibly converting a data format as part of a coding and decoding process, the apparatus comprising a coding unit and a decoding unit, the coding unit and decoding unit performing a forward transformation and a backward transformation reciprocally on data between unit systems having different resolution levels defined by a brightness and a color difference, the apparatus further comprising a data format reversibly converting unit for reversibly converting a data format,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and wherein a reversible data conversion is performed with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system, wherein the data format reversibly converting unit performs the reversible data conversion,

wherein the first unit system is for a first color space and the second unit system is for a second color space that is based on three primary colors of lights, the first color space being different than the second color space and the first color space having the lower resolution level and the second color space having the higher resolution level, and further wherein the reversible data conversion determines determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations is based on all of the component values of the other of the first and second color spaces, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data.

15. (Previously Presented) The apparatus as claimed in claim 14,

wherein the data format reversibly converting unit performs a digital color conversion by quantizing analog data in the first color space, and by using the first color space as the common unit system.

Claims 16 -18 (Cancelled)

19. (Previously Presented) The apparatus as claimed in claim 14, a color conversion in accordance with an international standard in which the data format for converting an analog video signal into digital data is specified.

20. (Cancelled)

21. (Previously Presented) An apparatus for reversibly converting a data format as part of a coding and decoding process, the apparatus comprising a coding unit and a decoding unit, the coding unit and decoding unit performing a forward transformation and a backward transformation reciprocally on data between unit systems having different resolution levels defined by a brightness and a color difference, the apparatus further comprising a data format reversibly converting unit for reversibly converting a data format,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and wherein a reversible data conversion is performed with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system, wherein the data format reversibly converting unit performs the reversible data conversion, and the first unit system is a first color space having the lower resolution level, and the second unit system is a second color space having the higher resolution level,

wherein the first unit system is for a first color space and the second unit system is for a second color space that is based on three primary colors of lights, the first color space being different than the second color space, and further wherein the reversible data conversion

determines each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations ~~is~~ based on all of the component values of the other of the first and second color spaces,

an original color based on the brightness and the color difference, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data.

Claims 22-24 (Cancelled)

25. (Previously Presented) A computer-implemented method for reversibly converting a data format as part of a coding and decoding process that includes compression, the computer-implemented method comprising:

performing a forward transformation and a backward transformation reciprocally on data between unit systems having different resolution levels,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and the method further comprising performing a reversible data conversion with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system,

wherein the data format reversibly converting part conducts the reversible data conversion in that the first unit system is a BMU unit system using an inch unit system and the second unit system is a 1/100 mm unit system using a meter unit system, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first color space to second data in the second color apace and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted and the first data corresponds to the third data, and

further wherein performing a reversible data conversion comprises determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations ~~is~~ based on all of the component values of the other of the first and second color spaces.

26. (Cancelled)

27. (Previously Presented) The computer-implemented method an claimed in claim 1, wherein the integer operation conducts the reversible conversion using powers of 2.

28. (Cancelled)

29. (Previously Presented) The computer-implemented method as claimed in claim 27, wherein the powers of 2 is conducted by bit shifts.

30. (Cancelled)

31. (Previously Presented) The computer-implemented method as claimed in claim 2, wherein with respect to each of data converted from the first unit system to the second unit system and data converted from the second unit system to the first unit system, a process for rounding up if a first decimal place of the data is equal to or greater than 5 and rounding down if the first decimal place of the data is less than 5 is conducted.

32. (Previously Presented) The computer-implemented method as claimed in claim 2, wherein a first process for rounding up if a first decimal place of data is equal to or greater than 5 and rounding down if the first decimal place of the data is less than 5 is conducted with respect to the data converted from the first unit system to converted from the second unit system, and a second process for rounding up if a first decimal place of data is equal to or greater than 6 and rounding down if the first decimal place of the data is less than 6 is conducted at a conversion from the data in the second unit system to data in the first unit system~~,~~.

33. (Cancelled)

34. (Currently Amended) An article of manufacture having one or more computer-readable ~~recording~~ medium ~~recording~~ embodied with program code to cause a computer to

perform a method for reversibly transforming a data format as part of a coding and decoding process that includes compression, the method comprising performing a forward transformation and a backward transformation reciprocally on data between unit systems having different resolution levels defined by a brightness and a color difference,

wherein in the forward transformation and the backward transformation, a first unit system having a lower resolution level is used as a common unit system, and the method further comprising performing a reversible data conversion with use of an integer operation for data in the first unit system and data in a second unit system having a higher resolution level higher than the first unit system,

wherein the first unit system is for a first color space and the second unit system is for a second color space that is based on three primary colors of lights, the first color space being different than the second color space, and further wherein performing the reversible data conversion comprises determining each component value of one of the first and second color spaces during data conversion in at least one of the forward and backward transformations based on all of the component values of the other of the first and second color spaces, and by using the first color space as the common unit system, the reversible data conversion is performed by the integer operation, so that the backward transformation to transform first data in the first color space to second data in the second color space and the forward transformation to transform the second data in the second color space to third data in the first color space are conducted, where the first data corresponds to the third data.

35. (Currently Amended) The computer-implemented method of Claim 1 wherein the first data in the first color space are YCbCr data, and the second data in the second color

space are RGB data, and the third data in the first color space are Y'Cb'Cr', and in a case of converting to the Y'Cb'Cr' data after the YCbCr data is converted into the RGB data, and further wherein the forward transformation transforms the RGB data to Y'Cb'CR' data using color converting functions having an integer operation and are defined as

$$Y = \left\lfloor \frac{219 \times (299 \times R + 587 \times G + 114 \times B) + 16 \times 255 \times 1000 + 255 \times 1000/2}{255 \times 1000} \right\rfloor \qquad ※$$

$$Cb = \left\lfloor \frac{224 \times 564 \times (-229 \times R - 587 \times G + 886 \times B) + 128 \times 255 \times 1000 \times 1000 + 255 \times 1000 \times 1000/2}{255 \times 1000 \times 1000} \right\rfloor$$

$$Cr = \left\lfloor \frac{224 \times 713 \times (701 \times R \quad 587 \times G \quad 114 \times \mathrm{B}) + 128 \times 255 \times 1000 \times 1000 + 255 \times 1000 \times 1000/2}{255 \times 1000 \times 1000} \right\rfloor$$

※$\lfloor\ \rfloor$: round a fractional part and the same in- the following

and wherein the backward transformation transforms the RGB data to YCbCr data using color converting functions that use an integer operation and are defined as

$$R = \left\lfloor \frac{[219 \times 1000 \times (Cr - 128) + 713 \times 224 \times (Y - 16)] \times 255 + 713 \times 224 \times 219/2}{713 \times 224 \times 219} \right\rfloor$$

$$[[\, G = \left\lfloor \frac{\begin{bmatrix} 713 \times 224 \times 587 \times 564(Y - 16) \\ - 299 \times 219 \times 564 \times 1000 \times (Cr - 128) \\ - 114 \times 219 \times 713 \times 1000 \times (cb - 128) \end{bmatrix} \times 255 + 219 \times 713 \times 224 \times 587 \times 564/2}{219 \times 713 \times 224 \times 587 \times 564} \right\rfloor]]$$

$$G = \left\lfloor \frac{\begin{bmatrix} 713 \times 224 \times 587 \times 564(Y-16) \\ -299 \times 219 \times 564 \times 1000 \times (Cr-128) \\ -114 \times 219 \times 713 \times 1000 \times (Cb-128) \end{bmatrix} \times 255 + 219 \times 713 \times 224 \times 587 \times 564/2}{219 \times 713 \times 224 \times 587 \times 564} \right\rfloor$$

$$B = \left\lfloor \frac{[219 \times 1000 \times (Cb-128) + 564 \times 224 \times (Y-16)] \times 255 + 564 \times 224 \times 219/2}{564 \times 224 \times 219} \right\rfloor .$$

36. (Currently Amended) The computer-implemented method defined in Claim 6 wherein the first data in the first color space are YCbCr data, and the second data in the second color space are quantized digital R(d)G(d)B(d) data, and the third data in the first color space are Y'Cb'Cr', and in a case of converting to the Y'Cb'Cr' data after the YCbCr data is converted into the RGB data,

wherein to convert analog R(a)G(a)B(a) data to YCbCr data, the forward transformation uses a color converting function defined as follows:

$$Y = \left\lfloor \frac{219 \times (77 \times R(a) + 150 \times G(a) + 29 \times B(a)) + 16 \times 256 \times 256 + 256 \times 128}{256 \times 256} \right\rfloor$$

$$Cb = \left\lfloor \frac{219 \times (-44 \times R(a) - 87 \times G(a) + 131 \times B(a)) + 128 \times 256 \times 256 + 256 \times 128}{256 \times 256} \right\rfloor$$

$$Cr = \left\lfloor \frac{219 \times (131 \times R(a) - 110 \times G(a) - 21 \times B(a)) + 128 \times 256 \times 256 + 256 \times 128}{256 \times 256} \right\rfloor$$

, where $0 \le R(a) \le 256$, $0 \le G(a) \le 256$, and $0 \le B(a) \le 256$;

and converts the YCbCr data to the R(d)G(d)B(d) with color converting functions that use an integer operation and are defined as follows:

$$R(d) = \left\lfloor \frac{(16772821 \times Y + 22904709 \times Cr - 41320 \times Cb - 2926513792) \times 2 + 16772821}{16772821 \times 2} \right\rfloor$$

$$G(d) = \left\lfloor \frac{(470873 \times Y - 329527 \times Cr - 157064 \times Cb + 62283648) \times 2 + 470873}{470873 \times 2} \right\rfloor$$

$$B(d) = \left\lfloor \frac{(16772821 \times Y - 102267 \times Cr + 29047960 \times Cb - 3705048704) \times 2 + 16772821}{16772821 \times 2} \right\rfloor$$

and wherein the backward transformation is conducted from the R(d)G(d)B(d) data to the Y'Cb'Cr' data is conducted with color converting functions that use an integer operation and are defined as follows:

$$Y' = \left\lfloor \frac{77 \times R(d) + 150 \times G(d) + 29 \times B(d) + 128}{256} \right\rfloor$$

$$Cb' = \left\lfloor \frac{-44 \times R(d) - 87 \times G(d) + 131 \times B(d) + 128 \times 256 + 128}{256} \right\rfloor$$

$$Cr' = \left\lfloor \frac{131 \times R(d) - 110 \times G(d) - 21 \times B(d) + 128 \times 256 + 128}{256} \right\rfloor.$$

37. (Currently Amended) The computer-implemented method defined in Claim 8 wherein the first data in the first color space are Y(o)Cb(o)Cr(o) data, the second data in the second color space are R(o)G(o)B(o) data, and the third data in the first color space are Y(o)'Cb(o)'Cr(o)', and when converting to the Y(o)'Cb(o)'Cr(o)' data after the Y(o)Cb(o)Cr(o) data is converted into the R(o)G(o)B(o) data,

the forward transformation is conducted from the RGB data to the Y(o)'Cb(o)'CR(o)' data using color converting functions that use an integer operation and are defined as

$$Y(o)=\left\lfloor \frac{2\times(x_M\times R(o)+(D-x_M-y_M)\times G(o)+y_M\times B(o))+D}{2\times D}\right\rfloor$$

$$Cb(o)=\left\lfloor \frac{\left\lfloor \frac{MAX_{RGB}+1}{2}\right\rfloor\times 2\times(D-y_M)-x_M\times R(o)-(D-x_M-y_M)\times G(o)+(D-y_M)\times(B(o)+1)}{2\times(D-y_M)}\right\rfloor$$

$$-\left\lfloor \frac{MAX_{RGB}+1}{2}\right\rfloor$$

$$Cr(o)=\left\lfloor \frac{\left\lfloor \frac{MAX_{RGB}+1}{2}\right\rfloor\times 2\times(D-x_M)+(D-x_M)\times(R(o)+1)-(D-x_M-y_M)\times G(o)-y_M\times B(o)}{2\times(D-x_M)}\right\rfloor$$

$$-\left\lfloor \frac{MAX_{RGB}+1}{2}\right\rfloor$$

, where X_M, Y_M, and D are all integers, and where $0\le X_M<D$, $0\le X_M<D$, and $X_M+Y_M<D$;

the backward transformation is conducted from the R(o)G(o)B(o) data to the Y(o)Cb(o)Cr(o) data using color converting functions that use an integer operation and are defined as

$$R(o)=\left\lfloor \frac{2\times(D\times Y(o)+2\times(D-x_M)\times Cr(o))+D}{2\times D}\right\rfloor$$

$$G(o)=\left\lfloor \frac{\begin{pmatrix}2\times((D-x_M-y_M)\times D\times Y(o)-2\times y_M\times(D-y_M)\times Cb(o)-2\times x_M\times(D-x_M)\times Cr(o))\\ +(D-x_M-y_M)\times D\end{pmatrix}}{2\times(D-x_M-y_M)\times D}\right\rfloor$$

$$B(o)=\left\lfloor \frac{2\times(D\times Y(o)+2\times(D-y_M)\times Cb(o))+D}{2\times D} \right\rfloor.$$

38. (Previously Presented) The computer-implemented method as claimed in claim 8, wherein a color conversion for the original color based on the brightness and the color difference,

the first data in the first color space are Y(o)Cb(o)Cr(o) data, the second data in the second color space are R(o)G(o)B(o) data, and the third data in the first color space are Y(o)'Cb(o)'Cr(o)', and in a case of converting to the Y(o)'Cb(o)'Cr(o)' data after the Y(o)Cb(o)Cr(o) data is converted into the R(o)G(o)B(o) data,

the forward transformation is conducted from the RGB data to the Y(o)'Cb(o)'CR(o)' data using color converting functions that use an integer operation and are defined as

$$Y(o)=\left\lfloor \frac{(299\times R(o)+587\times G(o)+114\times B(o))+500}{1000} \right\rfloor$$

$$Cb(o)=\left\lfloor \frac{128\times 2\times 886-299\times R(o)-587\times G(o)+886\times(B(o)+1)}{2\times 886} \right\rfloor-128$$

$$Cr(o)=\left\lfloor \frac{128\times 2\times 701+701\times(R(o)+1)-587\times G(o)-114\times B(o)}{2\times 701} \right\rfloor-128$$

and the backward transformation is conducted from the R(o)G(o)B(o) data to the Y(o)Cb(o)Cr(o) data using color converting functions that use an integer operation and are defined as

$$R(o)=\left\lfloor \frac{(1000\times Y(o)+1402\times Cr(o))+500}{1000} \right\rfloor$$

$$G(o) = \left\lfloor \frac{(587 \times 1000 \times Y(o) - 2 \times 114 \times 886 \times Cb(o) - 2 \times 299 \times 701 \times Cr(o)) + 587 \times 500)}{587 \times 1000} \right\rfloor$$

$$B(o) = \left\lfloor \frac{(1000 \times Y(o) + 1772 \times Cb(o)) + 500}{1000} \right\rfloor.$$